

CLAIMS

1. Machine-readable coded data disposed on or in a substrate in accordance with a layout, the layout having at least order n rotational symmetry, where n is at least two, the layout encoding an orientation codeword comprising a sequence of an integer multiple m of n symbols, where m is one or more, each encoded symbol being distributed at n locations about a center of rotational symmetry of the layout such that decoding the symbols at each of the n orientations of the layout produces n representations of the orientation codeword, each representation comprising a different cyclic shift of the orientation codeword and being indicative of the degree of rotation of the layout, and wherein the orientation codeword is fault tolerant.
2. Machine-readable coded data according to claim 1 wherein the orientation codeword is sufficiently fault tolerant such that each representation of the orientation codeword can be accurately decoded even if one of its symbols is corrupted.
3. Machine-readable coded data according to claim 1 wherein the orientation codeword is sufficiently fault tolerant such that each representation of the orientation codeword can be accurately decoded even if two or more of its symbols are corrupted.
4. Machine-readable coded data according to claim 1, wherein the layout is repeated on the substrate within a layout region.
5. Machine-readable coded data according to claim 4 wherein the layout region comprises a plurality of layouts of two or more layout types, each layout encoding its layout type.
6. Machine-readable coded data according to claim 5 encoding a distributed codeword wherein fragments of the distributed codeword are distributed between the two or more layout types in a predetermined manner such that the distributed codeword can be reconstructed from fragments located in a plurality of adjacent layouts of different types.
7. Machine-readable coded data according to claim 5 wherein the number of layout types is one of 2, 3, 4 and 6.

8. Machine-readable coded data according to claim 1 wherein the layout encodes a local codeword wherein fragments of the local codeword are distributed within the layout in a predetermined manner such that the local codeword can be reconstructed from the fragments.

9. Machine-readable coded data according to claim 4, wherein the layouts are packed together on the substrate.

10. Machine-readable coded data according to claim 1, wherein the layout is any of the following in shape:

linear;

square;

rectangular;

triangular; or

hexagonal.

11. Machine-readable coded data according to claim 1, wherein n is one of 2, 3, 4 and 6.

12. Machine-readable coded data according to claim 1, including one or more target features for enabling preliminary location and rotation of the layout to be determined by a machine used to read the coded data.

13. Machine-readable coded data according to claim 12, wherein the target features are configured to enable perspective correction of the coded data of the, or each, layout upon reading by the machine.

14. Machine-readable coded data according to claim 13, including at least four of the target features.

15. Machine-readable coded data according to any one of claims 12 to 14, including a plurality of the layouts, wherein at least some of the target features are

shared by at least two of the layouts.

16. Machine-readable coded data according to claim 1, the coded data being printed onto the substrate.

17. Machine-readable coded data according to claim 16, wherein the coded data is printed onto the surface in ink that is of low-visibility or is invisible to an average unaided human eye.

18. Machine-readable coded data according to claim 17, wherein the ink is an infrared ink that is substantially invisible to an average unaided human eye.

19. Machine-readable coded data according to claim 1, wherein the coded data of each layout defines user data.

20. Machine-readable coded data according to claim 19, wherein the user data includes location data indicative of a position of the layout pattern relative to a region of the surface.

21. Machine-readable coded data according to claim 19, wherein the user data includes identification data identifying a region of the surface within which the layout is disposed.

22. Machine-readable coded data according to any one of claims 19 to 21, wherein the user data includes function data identifying a function to be performed upon reading of the layout pattern or sub-pattern by the machine.

23. A surface bearing machine-readable coded data in accordance with claim 1.

24. A surface according to claim 23, the surface being flat or curved.

25. A surface according to claim 23, further including visible markings.

26. A surface according to claim 25, wherein the visible markings include any one or more of the following:

text;

graphics;

images;

forms;

fields; and

buttons.

27. A surface according to claim 25, wherein the visible marking are disposed adjacent to, or coincident with, at least some of the coded data.
28. A surface according to claim 23, the surface being defined by a substrate.
29. A surface according to claim 28, wherein the substrate is paper, card or another laminar medium.
30. A surface according to claim 23, configured for use as an interface surface for enabling user interaction with a computer.
31. A method of generating an interface surface, including the steps of:
- receiving, in a printer, user data;
- generating machine-readable coded data incorporating the user data, in accordance with claim 19; and
- printing the coded data onto a substrate.
32. A method according to claim 31, further including the step of printing visible markings on the substrate.
33. A method according to claim 32, wherein the coded data and visible markings are printed onto the substrate substantially simultaneously.

34. A method of using a sensing device to read machine-readable coded data according to claim 1, the method including the steps of:

- (a) reading, using the sensing device, the coded data of the layout;
- (b) decoding the coded data of the layout, thereby determining at least the representation of the orientation codeword; and
- (c) using the representation of the orientation codeword to determine a degree of rotation of the layout.

35. A method according to claim 34, wherein step (a) includes the substeps of:

imaging the substrate to generate an image thereof;

processing the image to locate one or more target features of the coded data; and

on the basis of the located target features, determining a position of at least one of the encoded symbols of the orientation codeword.